What is claimed is:

1. A method for limiting a vibration displacement of an electro-acoustical transducer, comprising the steps of:

providing an input electro-acoustical signal to a low frequency shelving and notch filter and to a displacement predictor block;

generating a displacement prediction signal by said displacement predictor block based on a predetermined criterion in response to said input electro-acoustical signal and providing said displacement prediction signal to a parameter calculator; and

generating a parameter signal by said parameter calculator in response to said displacement prediction signal and providing said parameter signal to said low frequency shelving and notch filter for generating an output signal and further providing said output signal to said electro-acoustical transducer thus limiting said vibration displacement.

2. The method of claim 1, wherein said electro-acoustical transducer is a loudspeaker.

3. The method of claim 1, wherein said low frequency shelving and notch filter is a second order filter with a z-domain transfer function given by

$$H_c(z) = \sigma_c \frac{1 + b_{1\cdot c} z^{-1} + b_{2\cdot c} z^{-2}}{1 + a_{1\cdot t} z^{-1} + a_{2\cdot t} z^{-2}},$$

wherein σ_c is a characteristic sensitivity of the low frequency shelving and notch filter, $b_{1\cdot c}$ and $b_{2\cdot c}$ are feedforward coefficients defining target zero locations, and $a_{1\cdot t}$ and $a_{2\cdot t}$ are feedback coefficients defining target pole locations.

4. The method of claim 3, wherein said parameter signal includes said characteristic sensitivity σ_c and said feedback coefficients $a_{1\cdot t}$ and $a_{1\cdot t}$.

5. The method of claim 1, further comprising the step of:

generating said output signal by the low frequency shelving and notch filter.

6. The method of claim 5, further comprising the step of:

providing the output signal to said electro-acoustical transducer.

7. The method of claim 6, wherein the output signal is amplified using a power amplifier prior to providing said output signal to said electro-acoustical transducer.

8. The method of claim 1, wherein the displacement prediction signal is provided to a peak detector of the parameter calculator.

9. The method of claim 8, wherein after the step of generating the displacement prediction signal, the method further comprises the step of:

generating a peak displacement prediction signal by the peak detector and providing said peak displacement prediction signal to a shelving frequency calculator of the parameter calculator.

10. The method of claim 9, further comprising the step of:

generating a shelving frequency signal by the shelving frequency calculator based on a predetermined criterion and providing said shelving frequency signal to a sensitivity and coefficient calculator of the parameter calculator for generating, based on said shelving frequency signal, the parameter signal.

11. The method of claim 1, wherein the input electro-acoustical signal is a digital signal.

12. The method of claim 1, wherein said low frequency shelving and notch filter is a second order filter with an s-domain transfer function given by

$$H_c(s) = \frac{s^2 + s\omega_c/Q_c + \omega_c^2}{s^2 + s\omega_t/Q_t + \omega_t^2},$$

wherein Q_c is a coefficient corresponding to a Q-factor of the electro-acoustical transducer, ω_c is a resonance frequency of the electro-acoustical transducer mounted in an enclosure, Q_t is a coefficient corresponding to a target equalized Q-factor, ω_t is a target equalized cut-off frequency.

13. The method of claim 12, wherein $Q_c=1/\sqrt{2}$, when the electro-acoustical transducer is critically damped.

14. The method of claim 12, wherein Q_c is a finite number larger than $1/\sqrt{2}$, when the electro-acoustical transducer is under-damped.

15. A computer program product comprising: a computer readable storage structure embodying computer program code thereon for execution by a computer processor with said computer program code, characterized in that it includes instructions for performing the steps of the method of claim 1 indicated as being performed by the displacement predictor block or by the parameter calculator or by both the displacement predictor block and the parameter calculator.

16. A signal processor for limiting a vibration displacement of an electro-acoustical transducer comprising:

a low frequency shelving and notch filter, responsive to an input electro-acoustical signal and to a parameter signal, for providing an output signal to said loudspeaker thus limiting said vibration displacement of said electro-acoustical transducer;

a displacement predictor block, responsive to said input electro-acoustical signal, for providing a displacement prediction signal; and

a parameter calculator, responsive to said displacement prediction signal, for providing the parameter signal.

17. The signal processor of claim 16, wherein the parameter calculator block comprises:

a peak detector, responsive to the displacement prediction signal, for providing a peak displacement prediction signal;

a shelving frequency calculator, responsive to the peak displacement prediction signal; for providing a shelving frequency signal; and

a sensitivity and coefficient calculator, responsive to said shelving frequency signal, for providing the parameter signal.

18. The signal processor of claim 16, wherein said low frequency shelving and notch filter is a second order digital filter with a z-domain transfer function given by

$$H_c(z) = \sigma_c \frac{1 + b_{1 \cdot c} z^{-1} + b_{2 \cdot c} z^{-2}}{1 + a_{1 \cdot t} z^{-1} + a_{2 \cdot t} z^{-2}},$$

wherein σ_c is a characteristic sensitivity of the low frequency shelving and notch filter, $b_{1 \cdot c}$ and $b_{2 \cdot c}$ are feedforward coefficients defining target zero locations, and $a_{1 \cdot t}$ and $a_{2 \cdot t}$ are feedback coefficients defining target pole locations.

19. The signal processor of claim 18, wherein said parameter signal includes said characteristic sensitivity σ_c and said feedback coefficients $a_{1 \cdot t}$ and $a_{1 \cdot t}$.

20. The signal processor of claim 16, wherein the output signal is provided to said electro-acoustical transducer or said the output signal is amplified using a power amplifier prior to providing said output signal to said electro-acoustical transducer.

21. The signal processor of claim 16, wherein the input electro-acoustical signal is a digital signal.

22. The signal processor of claim 16, wherein said low frequency shelving and notch filter is a second order filter with an s-domain transfer function given by

$$H_c(s) = \frac{s^2 + s\omega_c/Q_c + \omega_c^2}{s^2 + s\omega_t/Q_t + \omega_t^2},$$

wherein Q_c is a coefficient corresponding to a Q-factor of the electro-acoustical transducer, ω_c is a resonance frequency of the electro-acoustical transducer mounted in an enclosure, Q_t is a coefficient corresponding to a target equalized Q-factor, ω_t is a target equalized cut-off frequency.

23. The signal processor of claim 22, wherein $Q_c=1/\sqrt{2}$, when the electro-acoustical transducer is critically damped.

24. The signal processor of claim 22, wherein Q_c is a finite number larger than $1/\sqrt{2}$, when the electro-acoustical transducer is under-damped.

25. The signal processor of claim 16, wherein said electro-acoustical transducer is a loudspeaker.